**2.5 – Properties of Compounds**

Now that we know a bit about the names and shapes of molecules, let’s have a look at some of their properties and how they have been used in the past. We will then think about how they are still used today…

**Ionic Properties**

* Ionic compounds are often referred to as salts.
* Usually, they are hard and brittle. Their ions often arrange themselves to form complex crystals.
* They have high melting and boiling points. A high amount of energy is required to break the crystal structure.
* They are usually very soluble in water. The polar water molecules easily break the ionic bonds.
* When dissolved, they conduct electricity well. Electricity moves through the ions that form when the bonds are broken by water.

**\*\*An example from history: Modern day archaeology has actually deduced that First Nations people used to mine rock salt near the Great Lakes. While it is not known in detail what they used it for, it is thought that it was mostly for physiological needs (everyone needs at least some salt!).**

**Covalent Properties**

* Covalent compounds tend to be much softer than ionic compounds. While ionic crystals are very rigid and form solid structures, covalent molecules have weaker forces between atoms, and their atoms can therefore move around a lot easier. (Example: lego structure vs. plastic ball pit)
* They also have low melting and boiling points. Because the molecules do have weaker forces between atoms, it is easier to break them apart.
* They are usually not soluble in water. Polar water molecules do not have an effect on the non-polar covalent compounds.
* They are not good at conducting electricity. These compounds do not produce ions in solution, so are not good conductors.

**\*\* An example from history: When making teepees, First Nations people used to use animal hides. In order to do this, they had to apply a mixture of compounds and then submerge it in water for several days. After wringing the water out, they would then stretch the hide and let it dry. It was then ready to use. The hide did not dissolve in water, and was stretchy…. Seems quite covalent!**

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**Metallic Properties**

* Metals consist of a system of positive metal ions in a “sea” of electrons.
* Metallic bonding refers to the interactions between the electrons and metal nuclei.
* The sea of electrons give metals their physical properties:
  + Conduct heat and electricity (electrons free to move and conduct)
  + High melting and boiling points – atoms are very tightly packed, and bond strongly with the sea of electrons
  + Strong, but can be easily shaped without breaking
  + Shiny, also referred to as luster

**\*\*An example from history: While it may be assumed that metallic shaping did not take place until recently that is somewhat untrue. Native Americans in the British Columbia area have been found to have made ceremonial knives and daggers known as “coppers” in the 17th century. Copper and brass were also prevalent around this time in Ontario.**

**Van der waals forces – something to think about…**

* A Dutch scientist named Johannes van der Waals developed the idea of forces between molecules. These forces are weak, but exist in compounds…
  + Forces between dipoles: molecules such as NH3 are very dipolar. The slight positive and negative charges at the ends of these molecules attract one another.
  + Dispersion forces: Even in non-polar molecules, there are moments where a dipole property exists. Remember: electrons are constantly moving. There may be moments in time where they are more on one side of a molecule than another. These forces occur during temporary dipole moments.
  + Hydrogen bonding: Same as forces between dipoles, but gets a special name. Very common in water, and give water many of its properties.

(COOL DEMO TIME……YEAAHHH!)

**Activity time!**

In small groups, develop a list of how compounds with each of these properties are used in today’s world, and why those particular compounds are used in that case. When finished, show your list to Mr. O.